Tennessee Valley Authority, Post Office Box 2000, Decatur, Alabama 35609-2000

July 30, 2012

10 CFR 50.73

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Browns Ferry Nuclear Plant, Unit 3
Facility Operating License No. DPR-68
NRC Docket No. 50-296

Subject: **Licensee Event Report 50-296/2012-005-00**

The enclosed Licensee Event Report provides details of an automatic reactor scram due to an actuation of a main transformer differential relay. The Tennessee Valley Authority is submitting this report in accordance with 10 CFR 50.73(a)(2)(iv)(A), as any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph 10 CFR 50.73(a)(2)(iv)(B), reactor protection system including: reactor scram or reactor trip.

There are no new regulatory commitments contained in this letter. Should you have any questions concerning this submittal, please contact J. E. Emens, Jr., Nuclear Site Licensing Manager, at (256) 729-2636.

Respectfully,

K. J. Polson
Vice President

Enclosure: Licensee Event Report 50-296/2012-005-00 – Automatic Reactor Scram Due to an Actuation of a Main Transformer Differential Relay

cc (w/ Enclosure):

NRC Regional Administrator - Region II
NRC Senior Resident Inspector - Browns Ferry Nuclear Plant

IE22
NRR

ENCLOSURE

Browns Ferry Nuclear Plant,
Unit 3

Licensee Event Report 50-296/2012-005-00

Automatic Reactor Scram Due to an Actuation of a Main Transformer Differential Relay

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See Attached

NRC FORM 366 (10-2010) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 10/31/2013

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to FOIA/Privacy Section (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Browns Ferry Nuclear Plant, Unit 3	05000296	1 of 6

4. TITLE: Automatic Reactor Scram Due to an Actuation of a Main Transformer Differential Relay

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									N/A	05000
05	29	2012	2012	005	00	07	30	2012	FACILITY NAME: N/A	DOCKET NUMBER: 05000

9. OPERATING MODE

1

10. POWER LEVEL

076

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☒ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER *(Include Area Code)*
Eric Bates, Licensing Engineer	256-614-7180

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR
N/A	N/A	N/A

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

On May 29, 2012, at 0331 Central Daylight Time, the Browns Ferry Nuclear Plant (BFN), Unit 3, reactor automatically scrammed due to fast closure of turbine control valves that was initiated by a load reject signal on the Main Generator. The cause of the load reject signal was the actuation of the newly installed main transformer differential relay 387T which caused the scram. All systems responded as expected to the load reject signal. Main steam isolation valves remained open and reactor pressure was controlled by the main turbine bypass valves. No Emergency Core Cooling System or Reactor Core Isolation Cooling System reactor water level initiation set points were reached. Primary Containment Isolation System isolations from Groups 2, 3, 6, and 8 were received, and reactor water level was controlled by the Feedwater System.

There were two root causes identified: 1) the BFN management has not provided adequate management oversight and accountability for effective transition of the Protective Relay Group (PRG) and the associated responsibilities from Power Systems Operations to Nuclear Power Group (NPG) and 2) inadequate equipment and testing methodology.

The corrective actions to prevent recurrence include: 1) using the Nuclear Operating Model, utilize the Tennessee Valley Authority's strategic performance management process to ensure management alignment in the ownership and accountability for leadership expectations at BFN and 2) revise the transmission group field test procedures used by PRG and issue them as approved NPG procedures.

NARRATIVE

I. PLANT CONDITION(S)

At the time of discovery, Browns Ferry Nuclear Plant (BFN), Unit 3, was in Mode 1 at approximately 76 percent power.

II. DESCRIPTION OF EVENT

A. Event

On May 29, 2012, at 0331 Central Daylight Time (CDT), the BFN, Unit 3, reactor automatically scrammed due to fast closure of turbine control valves [V] that was initiated by a load reject signal on the Main Generator [TB]. The cause of the load reject signal was the actuation of the newly installed main transformer differential relay [RLY] 387T which caused the scram.

All systems responded as expected to the load reject signal. Main steam isolation valves (MSIVs) remained open and reactor pressure was controlled on the main turbine bypass valves. No Emergency Core Cooling System (ECCS) [BJ][BO][BM][SB] or Reactor Core Isolation Cooling (RCIC) System [BN] reactor water level initiation set points were reached. Primary Containment Isolation System (PCIS) [BD] isolations from Groups 2, 3, 6, and 8 were received, and reactor water level was controlled by the Feedwater System [SJ].

B. Inoperable Structures, Components, or Systems that Contributed to the Event

There were no inoperable structures, components, or systems that contributed to the event.

C. Dates and Approximate Times of Major Occurrences

May 29, 2012, 0331 CDT	The BFN, Unit 3, reactor automatically scrammed due to fast closure of turbine control valves that was initiated by a load reject signal on the Main Generator.
May 29, 2012, 0622 CDT	The BFN reported the event to the NRC.

D. Other Systems or Secondary Functions Affected

There were no other systems or secondary functions affected.

E. Method of Discovery

This event was identified when the BFN, Unit 3, reactor was automatically scrammed due to actuation of the main transformer differential relay 387T.

F. Operator Actions

Operations personnel entered emergency operating instruction due to low reactor water level (below +2 inches).

G. Safety System Responses

All systems responded as expected to the load reject signal. MSIVs remained open and reactor pressure was controlled on the main turbine bypass valves. No ECCS or RCIC System reactor water level initiation set points were reached. PCIS isolations from Groups 2, 3, 6, and 8 were received, and reactor water level was controlled by the Feedwater System.

III. CAUSE OF THE EVENT

A. Immediate Cause

The immediate cause of this event was the vendor (Asea Brown Boveri) manufactured a current transformer (CT) [XCT] with a reversed polarity and the Tennessee Valley Authority (TVA) installed this CT in the plant.

B. Root Cause

There were two root causes identified:

1. The BFN management has not provided adequate management oversight and accountability for effective transition of the Protective Relay Group (PRG) and the associated responsibilities from Power Systems Operations (PSO) to Nuclear Power Group (NPG) within TVA.
2. Inadequate equipment and testing methodology.

C. Contributing Factors

1. The change management plan for transferring the PRG ownership from PSO to NPG was ineffectively implemented.
2. The written instructions were inadequate to perform maintenance on the CTs. The work order used to bench test the new CTs was inappropriately classified as minor maintenance and lacked the detail required to adequately test the CTs. The transmission group field test procedure, the test scoping document, post modification testing instruction, vendor manual, and design change notice procedure do not provide adequate guidance. In addition, the test procedure did not delineate critical steps, did not require concurrent verification, and had no acceptance criteria.

IV. ANALYSIS OF THE EVENT

The TVA is submitting this report in accordance with 10 CFR 50.73(a)(2)(iv)(A), as any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph 10 CFR 50.73(a)(2)(iv)(B), reactor protection system including: reactor scram or reactor trip.

The scram investigation identified that the main transformer differential relay 387T actuated because a manufacturing defect in a new generator bus CT caused an incorrect excitation input to the new main transformer differential relay 387T that was installed during the BFN, Unit 3, refueling outage. The manufacturing defect was the

NARRATIVE

reversed polarity of a CT. Actuation of the main transformer differential relay 387T caused the load reject that resulted in a reactor scram. Subsequent investigation revealed that the polarity of one of the 36 newly installed CTs was reversed giving the main transformer differential relay 387T a false signal.

This event was a result of multiple breakdowns in personnel performance. The lack of management oversight resulted in the use of a PRG technician who was not fully qualified to perform bench testing of the new CTs. The bench test of the new CTs was required to verify the CTs polarity and amplitude. Since one of the 36 newly installed CTs polarity was reversed, it gave the main transformer differential relay 387T a false signal which resulted in a scram. The use of a test procedure, which did not include NPG human error prevention techniques, during the performance of the bench test by the PRG technician contributed to the failure to identify the faulty CT prior to installation. The lack of self checking by engineers and work planning resulted in the use of an inadequate test procedure that was not approved for use by NPG.

Extent of Condition

The extent of condition is the polarity and amplitude verification of all inputs for the CTs for BFN, Units 1 and 2, utilizing the vendor commissioning process. The commissioning process consists of a test that is used to monitor the relay while it is being returned to service. After the Main Transformer is energized, the commissioning test verifies the inputs from the CTs are the correct amperage and phase angle.

Extent of Cause

The extent of cause includes inadequate management oversight and accountability, and all transmission group field test procedures that contain testing equipment and methodology requirements for the PRG at TVA nuclear facilities.

V. ASSESSMENT OF SAFETY CONSEQUENCES

All systems responded as expected to the load reject signal. MSIVs remained open and reactor pressure was controlled on the main turbine bypass valves. No ECCS or RCIC System reactor water level initiation set points were reached. PCIS isolations from Groups 2, 3, 6, and 8 were received, and reactor water level was controlled by the Feedwater System in the normal band.

A probabilistic risk assessment evaluation was performed for this event. It was determined that the delta core damage frequency was less than 1.0E-06 and that the delta large early release frequency was less than 1.0E-07. This is considered a very small change which would be very low safety significance.

Therefore, this condition posed little risk to public health and safety.

NARRATIVE

VI. CORRECTIVE ACTIONS - The corrective actions are being managed by TVA's corrective action program.

A. Immediate Corrective Actions

1. The CT polarity input to the main transformer differential relay 387T was corrected by swapping leads.
2. The polarity was tested satisfactorily on all remaining newly installed CTs.

B. Corrective Actions

1. Implement a change management plan for transferring the PRG ownership from PSO to NPG.
2. Perform a commissioning test on the BFN, Units 1 and 2, digital differential protective relays in accordance with the vendor manual and verify the CT inputs are of the correct amplitude and polarity prior to restart.
3. Appropriate personnel action will be taken in accordance with the TVA process for the work planner and the engineer that created the work package and approved the work package that included a non-NPG approved procedure. Also, work planners and engineers will be instructed to ensure procedures identified as "for use" are approved and verified to be acceptable for performing work in accordance with existing procedure NPG-SPP-01.2, Administration of Site Technical Procedures, prior to creating work packages and approving the applicable work packages.

C. Corrective Actions to Prevent Recurrence

1. Revise the transmission group field test procedures used by PRG and issue them as approved NPG procedures. The revised procedures will include NPG standards and expectations for human error prevention techniques and risk sensitive activities.
2. Using the Nuclear Operating Model, utilize TVA's strategic performance management process to ensure management alignment in the ownership and accountability for leadership expectations at BFN.

VII. ADDITIONAL INFORMATION

A. Failed Components

There were no failed components.

B. Previous Similar Events

A search of BFN, Units 1, 2, and 3, LERs for approximately the past five years did not identify any similar events.

A search was performed on the BFN corrective action program. Similar concerns regarding management oversight, change management, and inadequate

procedures were identified in problem evaluation reports (PERs) 139781, 151772, 162391, and 177395.

C. Additional Information

The corrective action document for this report is PER 558183.

D. Safety System Functional Failure Consideration

In accordance with NEI 99-02, this issue is not considered a safety system functional failure.

E. Scram With Complications Consideration

This event was not a complicated scram.

VIII. COMMITMENTS

There are no commitments.